Obesidad y trastornos del sueño

Dr. Pérez Grimaldi
F.E.A. Neumología

¿Qué es el sueño?

Latín: *somnus*

RAE

- Acto de dormir
- Gana de dormir

Estado normal, recurrente
y reversible de disminución
de la percepción y de la
capacidad de respuesta al
medio ambiente

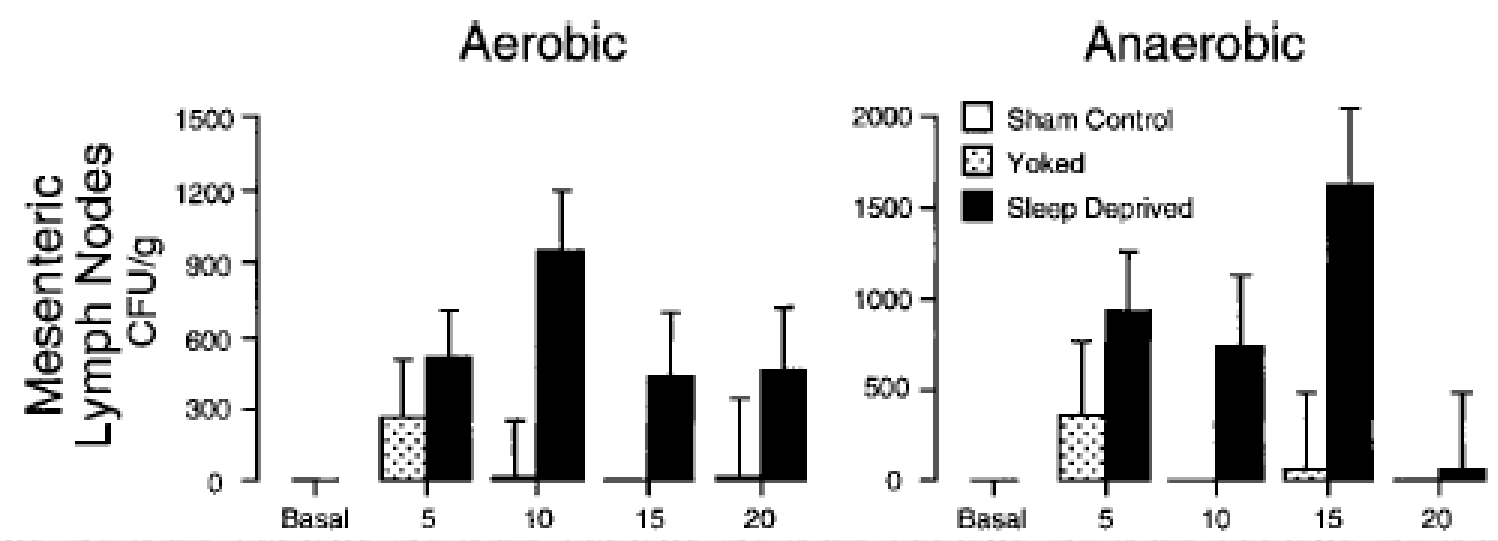
¿Para qué sirve?

Cortisol

Glucosa e insulina

H. del crecimiento

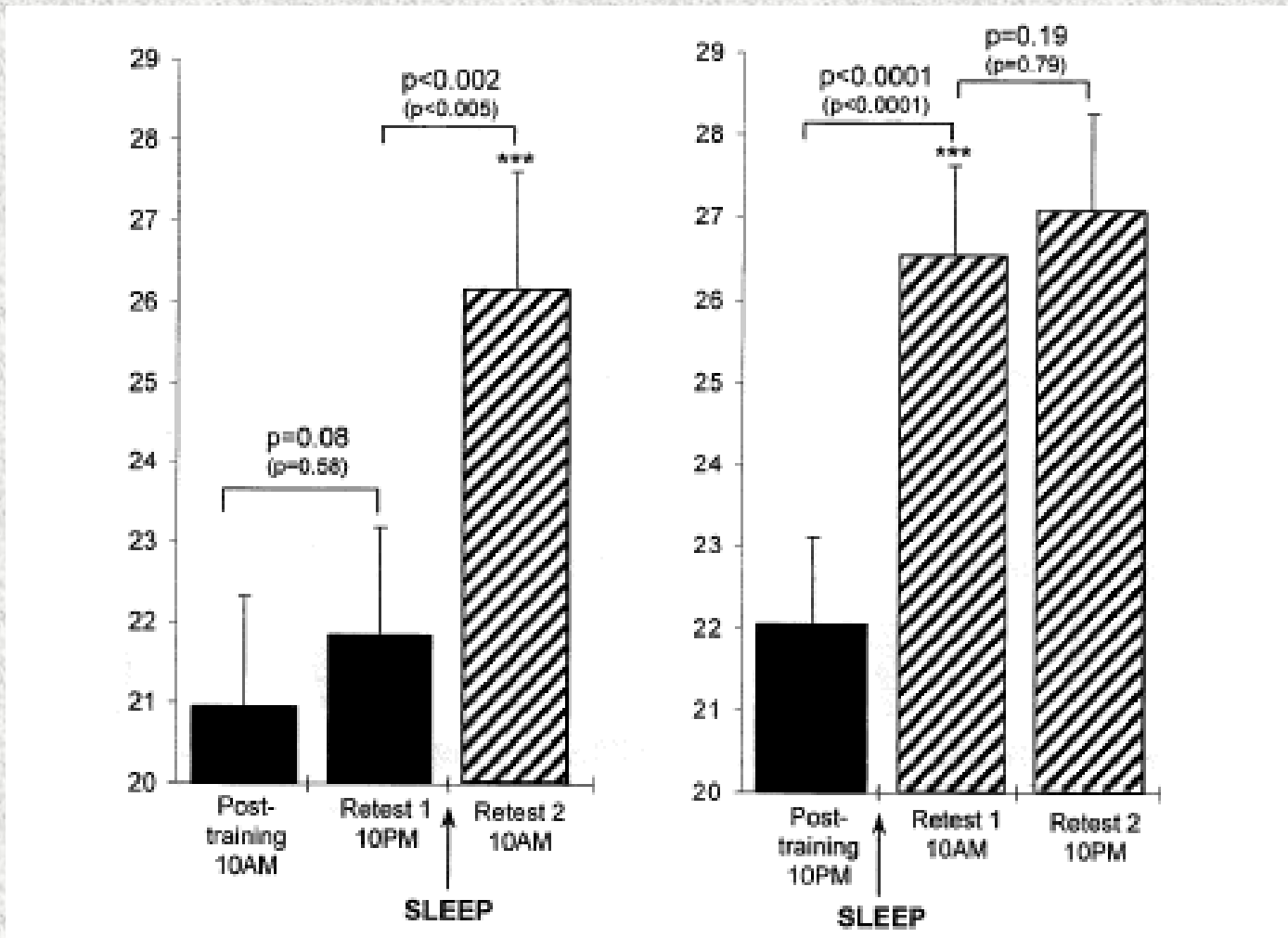
Prolactina



Am J Physiol Regul Integr Comp Physiol 278:R905-R916, 2000.

Carol A. Everson and Linda A. Toth

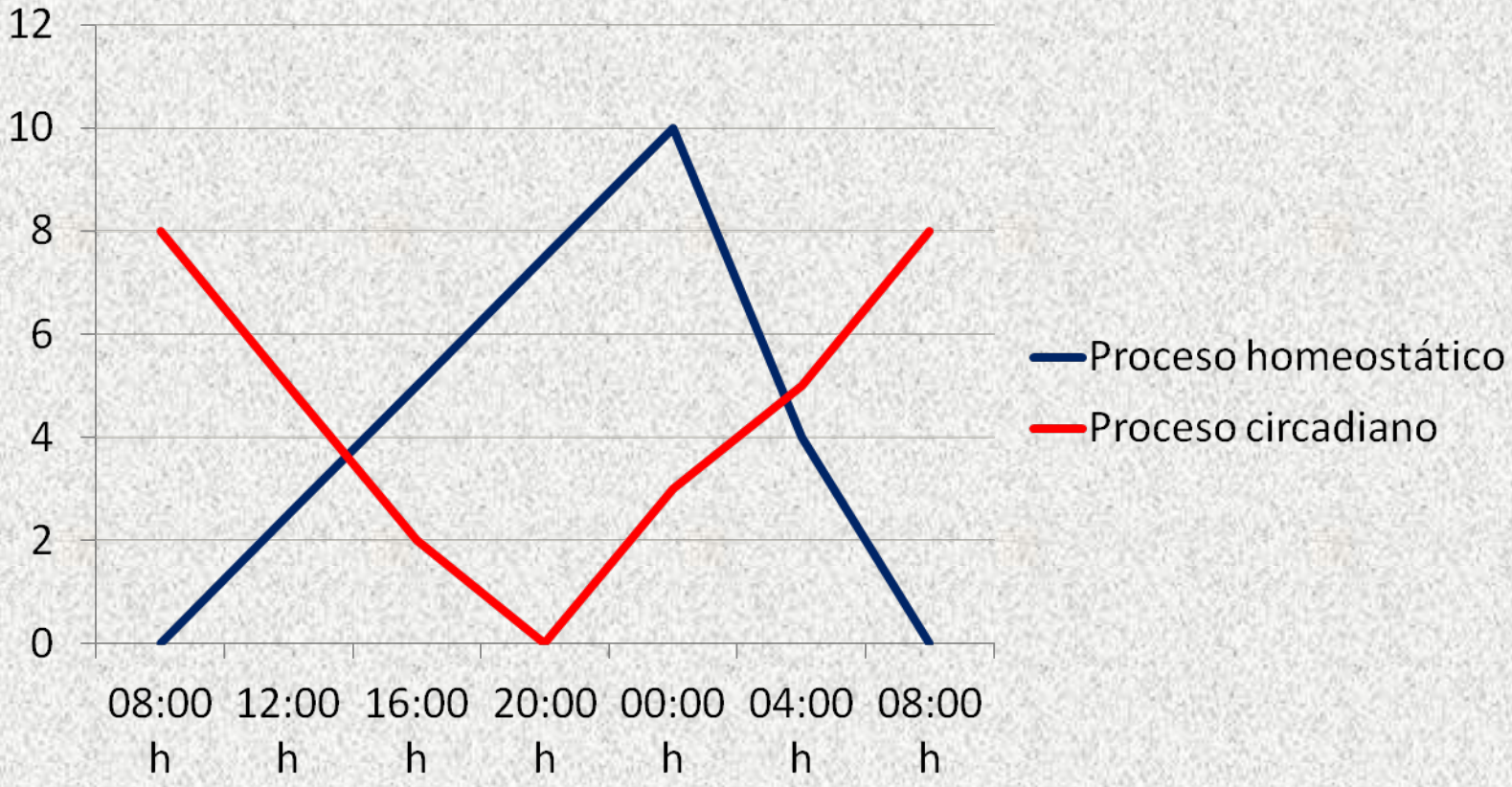
Systemic bacterial invasion induced by sleep



Neuron, Vol. 35, 205–211, July 3, 2002,

Practice with Sleep Makes Perfect: Sleep-Dependent Motor Skill Learning

Regulación del sueño

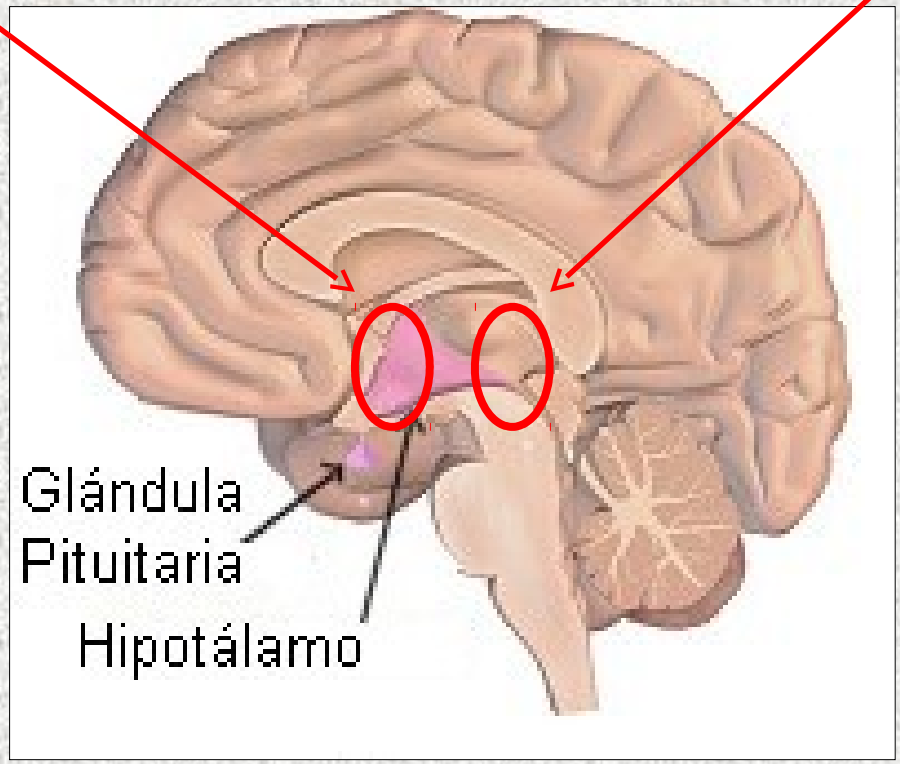


Sueño

Vigilia

ABA, galanina

Hipocretina



1.1. *Trastornos intrínsecos del sueño*

1. Insomnio psicofisiológico.
2. Dispercepción del estado de sueño.
3. Insomnio idiopático.
4. Narcolepsia.
5. Hipersomnia recurrente.
6. Hipersomnia idiopática.
7. Hipersomnia postraumática.
8. Síndrome de Apnea Obstructiva del Sueño.
9. Síndrome de Apnea Central del Sueño.
10. Síndrome de Hipoventilación Alveolar Central.
Síndrome de Pickwick.
11. Síndrome de Movimientos Periódicos de las Piernas.
12. Síndrome de las Piernas Inquietas.
13. Otras alteraciones intrínsecas del sueño no especificadas.

1.2. *Trastornos extrínsecos del sueño*

1. Higiene de sueño inadecuada.
2. Trastorno del sueño de causa ambiental.
3. Insomnio de altitud.
4. Trastorno de ajuste del sueño.
5. Síndrome de sueño insuficiente.
6. Trastorno por sueño limitado.
7. Trastorno asociado al inicio del sueño.
8. Insomnio por alergia alimentaria.
9. Síndrome asociado a ingestión nocturna.
10. Trastorno del sueño dependiente de hipnóticos.
11. Trastorno del sueño dependiente de estimulantes.
12. Trastornos del sueño dependiente del alcohol.
13. Trastornos del sueño inducido por tóxicos.
14. Otros trastornos extrínsecos del sueño no especificados.

1.3. *Trastornos del ritmo circadiano del sueño*

1. Síndrome de cambio de uso horario o *jet lag*.
2. Trastorno del sueño por trabajo a turnos.
3. Patrón irregular de vigilia-sueño.
4. Síndrome de fase de sueño retardada.
5. Síndrome de fase de sueño precoz.
6. Trastorno de sueño-vigilia no de 24 horas.
7. Otros trastornos del ritmo circadiano no especificados.

2. Parasomnias

2.1. *Trastornos del despertar*
Manifestaciones de despertar parcial que suceden durante el sueño:
1. Despertares con confusión.
2. Sonambulismo.
3. Terrores nocturnos.

2.2. *Trastornos de la transición vigilia-sueño*
1. Trastorno de movimiento rítmico.
2. Ataques de sueño.
3. Somniloquia.
4. Calambres de piernas nocturnos.

2.3. *Parasomnias normalmente relacionadas con sueño REM*
1. Pesadillas.
2. Parálisis de sueño.
3. Alteraciones de la erección peneana en el sueño.
4. Erecciones dolorosas en el sueño.
5. Paro sinusal en fase REM.
6. Trastornos de conducta en fase REM.

2.4. *Otras parasomnias*
1. Bruxismo en el sueño.
2. Enuresis en el sueño.
3. Síndrome de deglución anormal en el sueño.
4. Síndrome de muerte súbita nocturna inexplicada.
5. Otras parasomnias no especificadas.

3. Trastornos del sueño asociados a enfermedades médicas y psiquiátricas

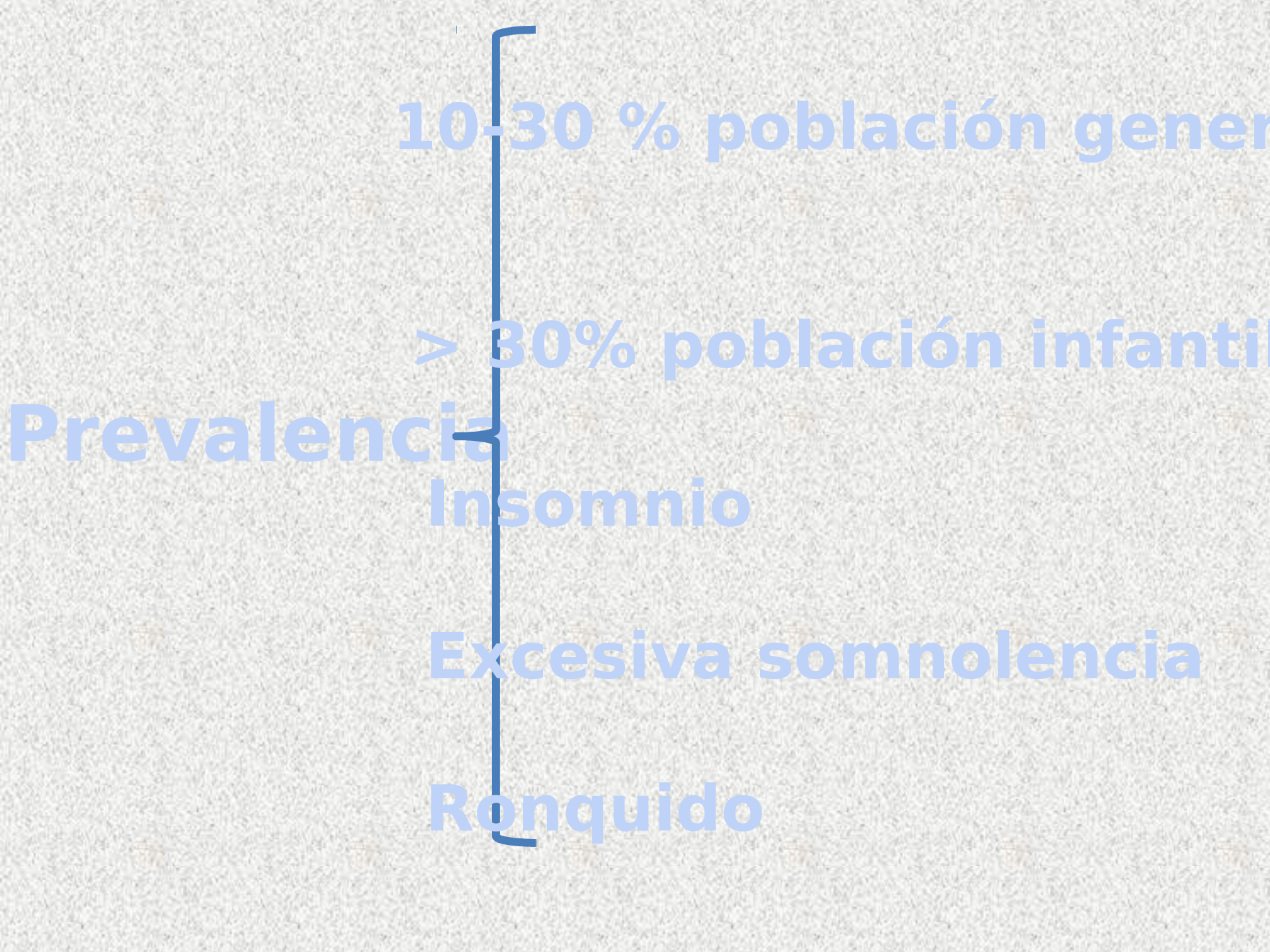
3.1. *Asociadas a trastornos mentales*
1. Psicosis.
2. Trastornos del carácter.
3. Trastorno de ansiedad y depresión.
4. Trastorno de pánico.
5. Alcoholismo.
6. Otras drogadicciones.

3.2. *Asociados a trastornos neurológicos*
1. Trastornos degenerativos cerebrales.
2. Demencia.
3. Parkinsonismo.
4. Insomnio familiar fatal.
5. Epilepsia asociada al sueño.
6. Estatus epiléptico eléctrico del sueño.
7. Cefaleas asociadas al sueño.

3.3. *Asociados a otras enfermedades médicas*
1. Enfermedad del sueño.
2. Isquemia cardíaca nocturna.
3. Enfermedad Pulmonar Obstructiva Crónica (EPOC).
4. Asma relacionado al sueño.
5. Reflujo gastroesofágico relacionado al sueño.
6. Enfermedad péptica ulcerosa.
7. Fibromialgia.

4. Otros trastornos del sueño propuestos

1. Paciente con sueño corto.
2. Paciente con sueño largo.
3. Síndrome de subdespertar.
4. Mioclonías fragmentarias.
5. Hiperhidrosis del sueño.
6. Trastorno del sueño asociado a la menstruac
7. Trastorno del sueño asociado al embarazo.
8. Alucinaciones terroríficas hipnagógicas.
9. Taquipnea neurógena del sueño.
10. Laringoespasmo relacionado con el sueño.
11. Síndrome de asfixia del sueño.


10-30 % población gener
> 30% población infantil
Prevalencia
Insomnio
Excesiva somnolencia
Ronquido

¿QUÉ OCURRE CON LA OBESIDAD?

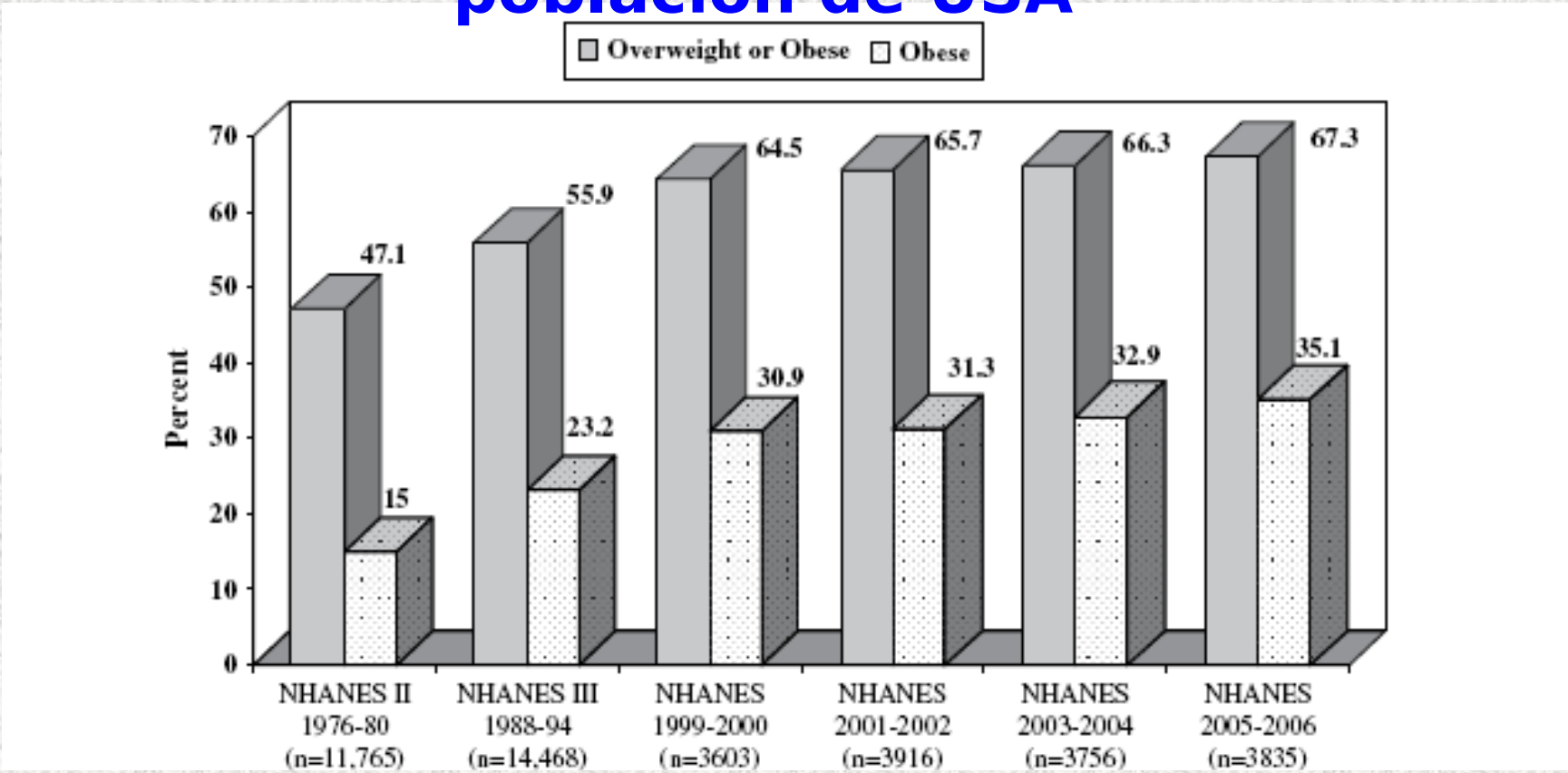
33% de la p ión adulta es obesa

con

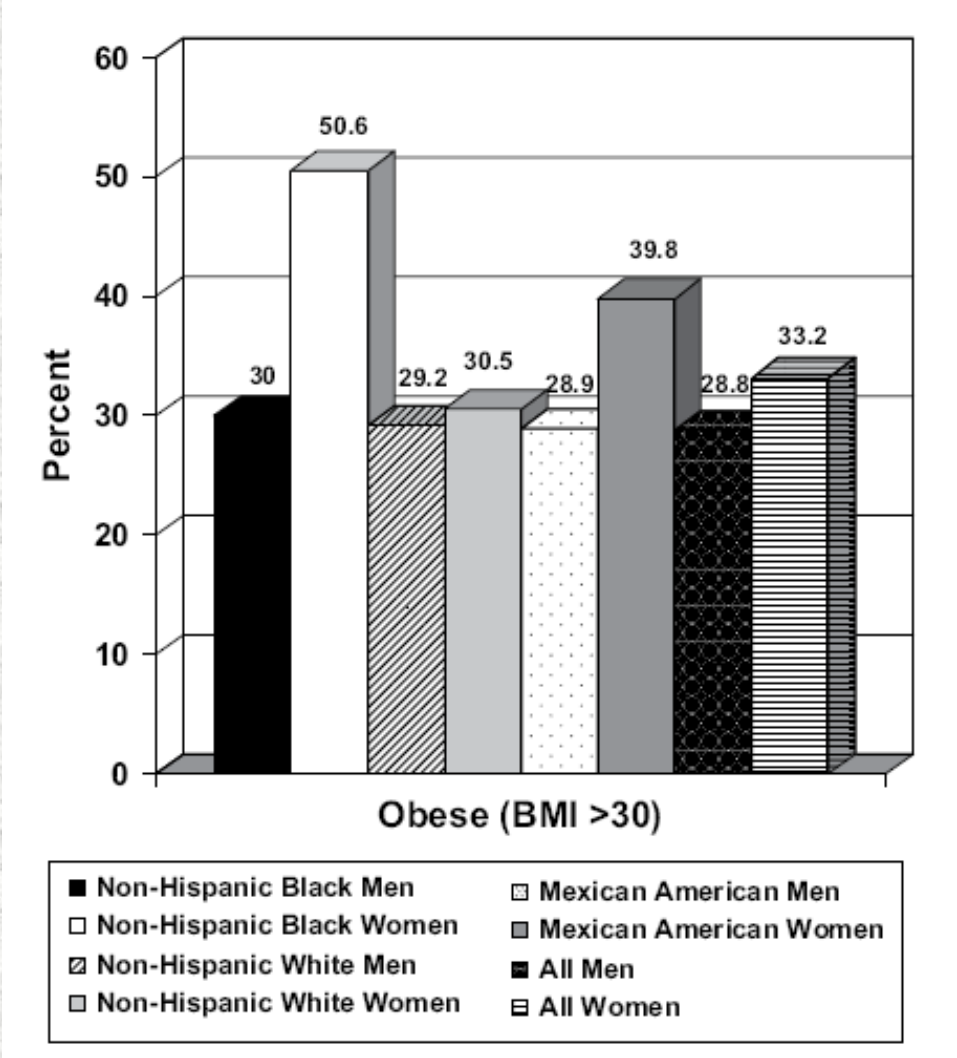
17% sobrep
infantil

Epidemia de obesidad

Previsiones para 2030 > 50% población de USA



Clin Chest Med 30 (2009) 415-44
Victoria A.Catenacci, James O. Hill, Holly R. Wyatt
The Obesity Epidemic



Clin Chest Med 30 (2009) 415-44
Victoria A.Catenacci, James O. Hill, Holly R. Wyatt
The Obesity Epidemic

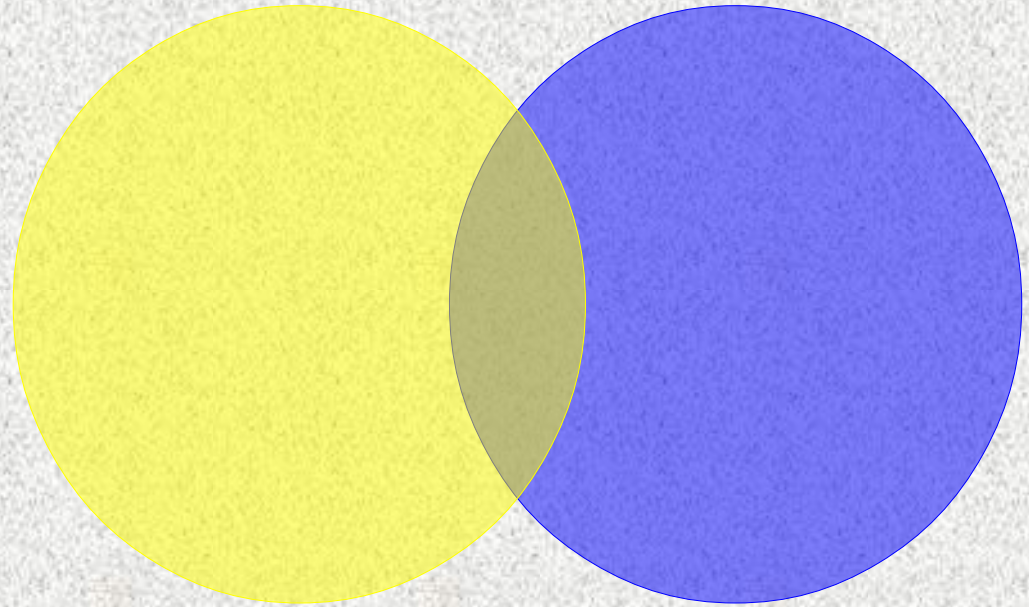
Obesidad en adultos: 14.5%

Sobrepeso en adultos: 38.5%

Obesidad en población infantil y juvenil: 13.9%

Fuente: Ministerio de Sanidad, Política Social e Igualdad

Existe una asociación entre obesidad y trastornos del sueño



¿Existe una relación?
¿En qué sentido?

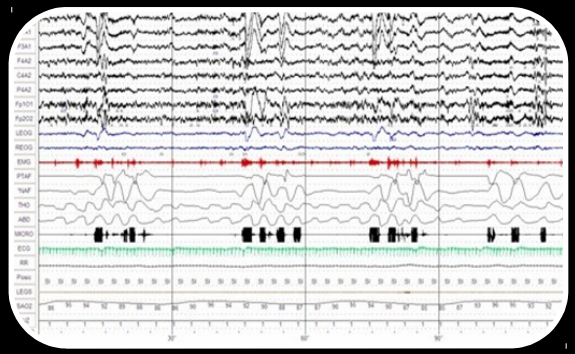
De la obesidad...

...a los trastornos del sueño

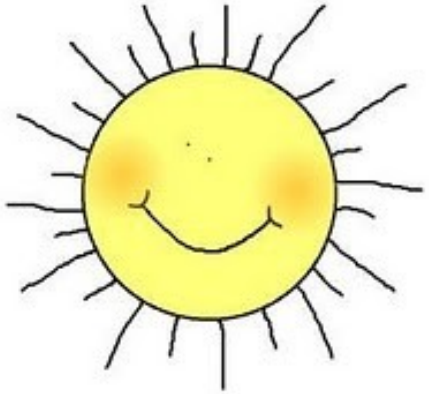
SÍNDROME DE APNEAS E HIPOPNEAS DEL SUEÑO

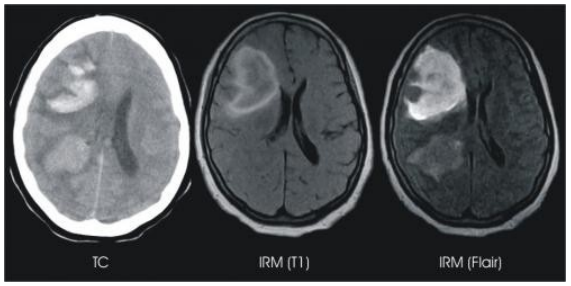
SAHS

SLEEP APNEA HYPOPNEA SYNDROME



FINGER
FOXIME
SPO%
PR/BPM




TC
IRM (T1)
IRM (Flair)

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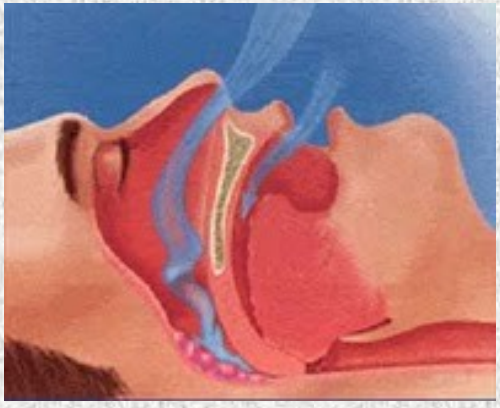
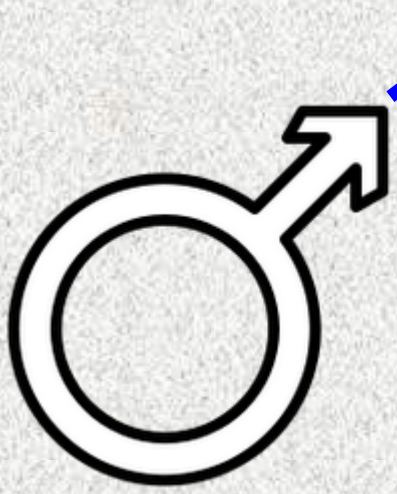
www.blogscienze.com



Valium®
Diazepam
5 mg
Roche
60 comprimidos



www.cirugiaortognatica.es
Dr. E. Lalinde

La obesidad es el principal factor de riesgo de SAHS

Table 5. Odds Ratios for Sleep-Disordered Breathing and Measures of Body Habitus.*

Measure	SD of Covariate	Odds Ratio for a 1-SD Increment in the Covariate	95% CI
Weight (kg)	10.12	2.00	1.68–2.24
Body-mass index†	5.67	4.17	2.89–6.04
Girth (cm)			
Neck	4.49	5.00	3.29–7.61
Waist	15.29	4.12	2.91–5.83
Hip	12.65	3.86	2.71–5.53
Waist:hip ratio	0.09	3.41	2.27–5.13
Skin-fold thickness (mm)			
Bicep	6.76	2.76	2.02–3.77
Tricep	7.43	2.49	1.85–3.34
Subscapular	7.83	2.29	1.77–2.95
Suprailiac	10.40	1.87	1.53–2.48

*Sleep-disordered breathing was defined as an apnea–hypopnea score of 5 or higher. The odds ratios are for the comparison with subjects who were not habitual snorers and whose apnea–hypopnea scores were below 5. All the logistic-regression models included variables for age in years and sex. CI denotes confidence interval.

†The weight in kilograms divided by the square of the height in meters.

N ENGL J MED 1993; 328:1230-1235

Terry Young, Mari Palta, Jerome Dempsey, James Skatrud, Steven Weber, and Safwan Badr The Occurrence of Sleep-Disordered Breathing among Middle-Aged Adults

Figure. Mean Change in the Apnea-Hypopnea Index AHI by Weight Change Category

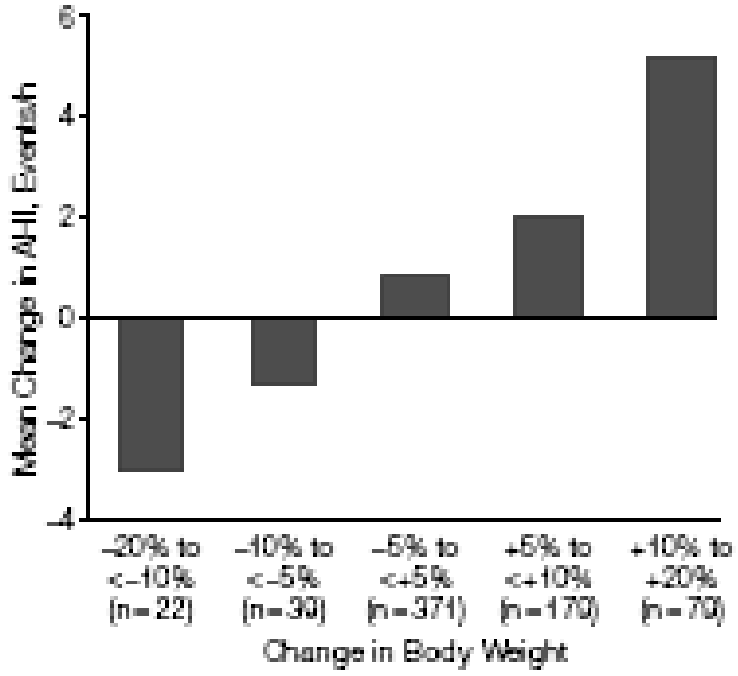


Table 2. Estimated Percent Change in the AHI for Selected Decrements and Increments of Percent Body Weight*

Percent Change in Weight (vs No Change)	Estimated Percent Change in AHI (95% Confidence Interval)†
−20	−48 (−58 to −35)
−10	−26 (−34 to −18)
−5	−14 (−18 to −9)
+5	+15 (+10 to +21)
+10	+32 (+20 to +45)
+20	+70 (+42 to +104)

*AHI indicates apnea-hypopnea index. Adjusted for sex, change in cigarette packs/wk, baseline body mass index (kg/m²), and baseline age. All $P<.001$.

†In addition to change expected if weight remained stable.

JAMA 2000;284:3015–3021.

Peppard PE, Young T, Palta M, Dempsey J, Skatrud J.
Longitudinal study of moderate weight change and sleep-disordered breathing.

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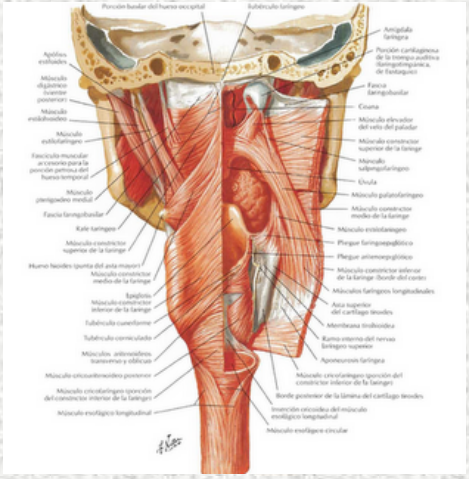
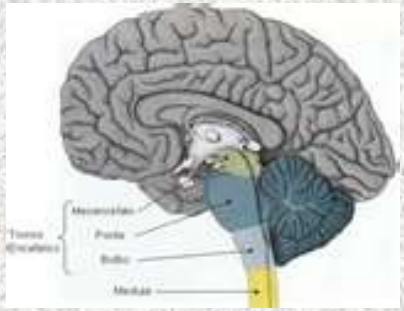
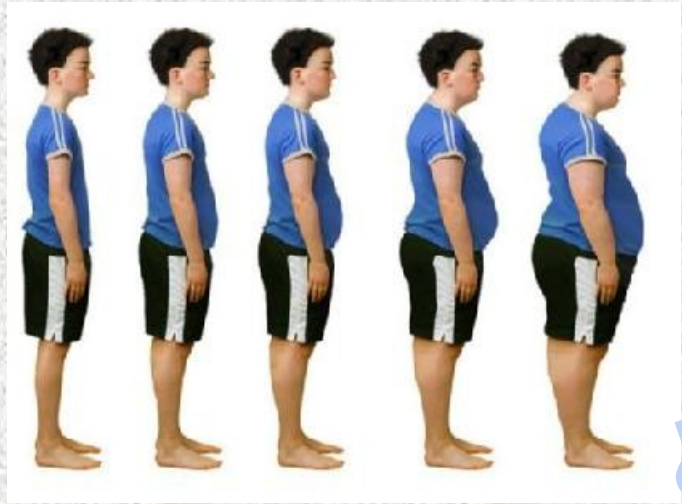
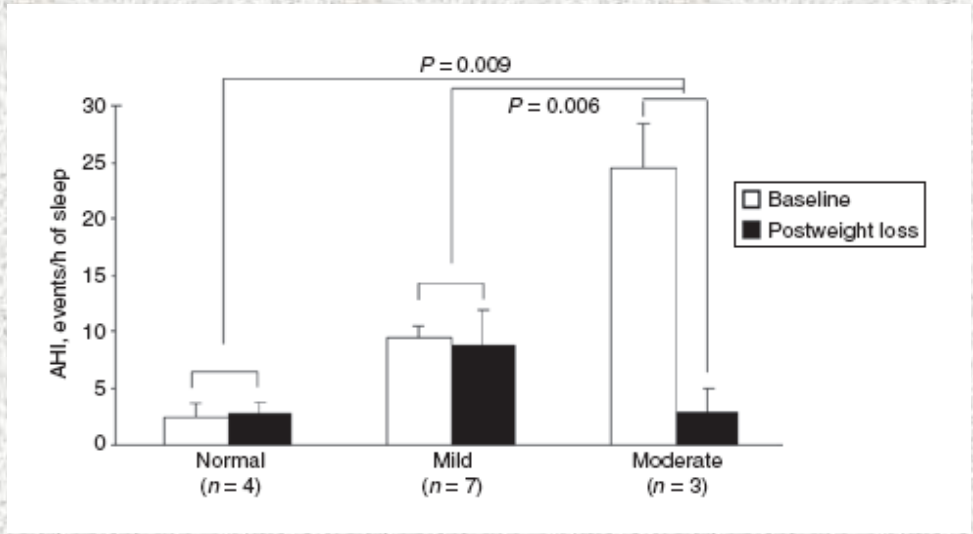




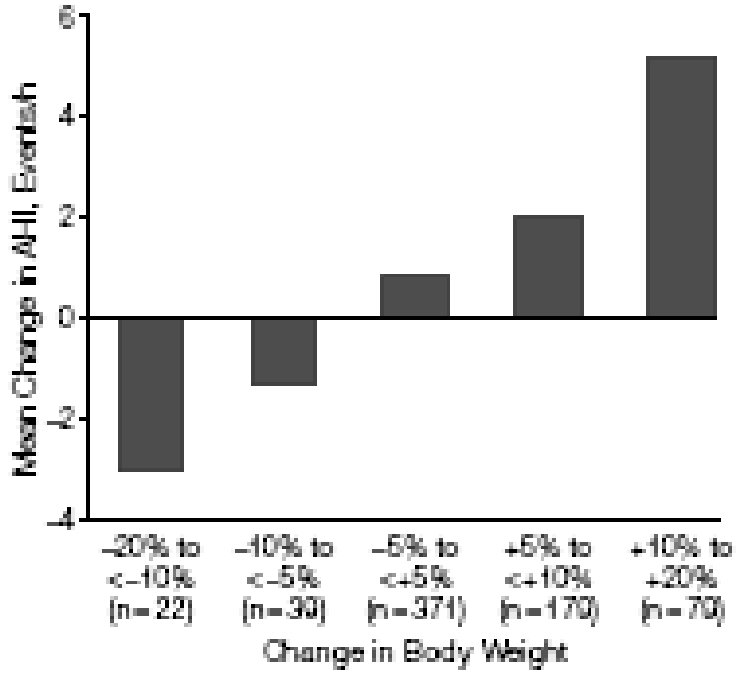


¿Y si perdemos peso?



Obesity (2008) **17,** 84–91.
Teri L. Hernandez *et al*
Effects of Maintained Weight Loss on Sleep Dynamics and Neck Morphology in Severely Obese Adults

Figure. Mean Change in the Apnea-Hypopnea Index AHI by Weight Change Category



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†In addition to change expected if weight remained stable.

JAMA 2000;284:3015–3021.

Peppard PE, Young T, Palta M, Dempsey J, Skatrud J.
Longitudinal study of moderate weight change and sleep-disordered breathing.

¿Qué ocurre a largo plazo?

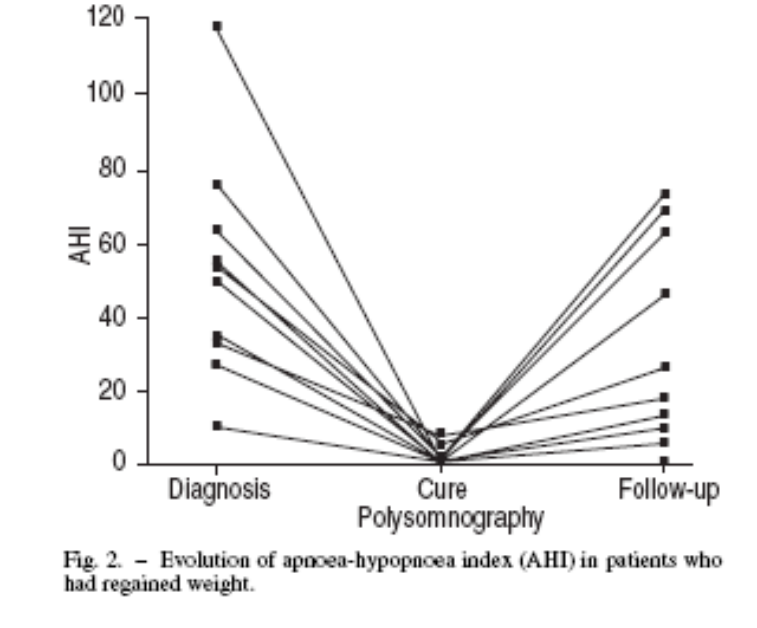

Fig. 2. – Evolution of apnoea-hypopnoea index (AHI) in patients who had regained weight.

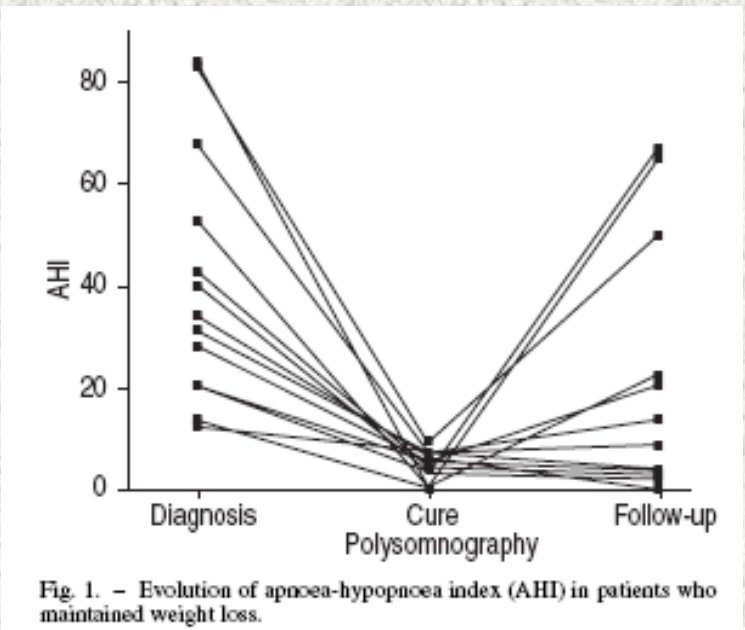

Fig. 1. – Evolution of apnoea-hypopnoea index (AHI) in patients who maintained weight loss.

Eur Respir J 1998; 12: 1156–1159

G. Sampol, X. Muñoz, M.T. Sagalés, S. Martí, A. Roca, M. Dolors de la Calzada,P. Lloberes, F. Morell

Long-term efficacy of dietary weight loss in sleep apnoea/ hypopnoea syndrome

1) IMC > 40

2) IMC > 35 + comorbilidad significativa

N	Procedure	Presurgery AHI	Postsurgery AHI	Presurgery BMI	Postsurgery BMI	% Weight Loss	Follow-up
49	LAGB	61 ± 6/h	13.4 ± 13/h	52.7 ± 9.5	37.2 ± 7.2	50.1 ± 15	12–42 months
13	Roux-en-Y	46.5/h	16/h	55.5 ± 10.1	34.1 ± 8.1	—	18 months
8	Roux-en-Y	55 ± 31/h	14 ± 17/h	49 ± 12	34 ± 12	31	28 ± 20 months
101	Roux-en-Y	51 ± 4/h	15 ± 2/h	56 ± 1	38 ± 1	—	6–42 months
47	Roux-en-Y	60.8 ± 35.5/h	8.0 ± 11.8/h 34.5 ± 23.1/h	—	—	—	1 year 7 years
14	Roux-en-Y VBG	40 ± 28/h	11 ± 16.4/h 24 ± 23/h	45 ± 7.2	33 ± 7.5 35 ± 6	—	2–7 months 5–10 years
24	Gastric banding	47 ± 9/h	24.5 ± 18.1/h	51.0 ± 10.4	32.1 ± 5.5	—	1 year

Clin Chest Med 30 (2009) 455–465
Neomi Shah, MD,MPHa, Francoise Roux, MD, PhDb.
The Relationship of Obesity and Obstructive Sleep Apnea

1) La obesidad es el principal factor de riesgo de SAHS.

2) La pérdida de peso mejora el SAHS.

3) En muchos casos no se logrará la curación completa del SAHS.

4) La enfermedad puede reaparecer tiempo después aunque no se recupere el peso.

Player's Cigarettes.

The Fat Boy

Pickwick Papers

A Series of 50

CHARACTERS FROM DICKENS

21

THE FAT BOY.

(*The Pickwick Papers.*)

A somnolent youth in the service of old Wardle, who retains him mainly as a natural curiosity. Evinces animation however when eatables are to the fore, and "watches the play of the knives and forks and the progress of the choice morsels from the dishes to the mouths of the company, with a kind of dark and gloomy joy." "Joe—damn that boy, he's gone to sleep again!"

ISSUED BY

JOHN PLAYER & SONS.

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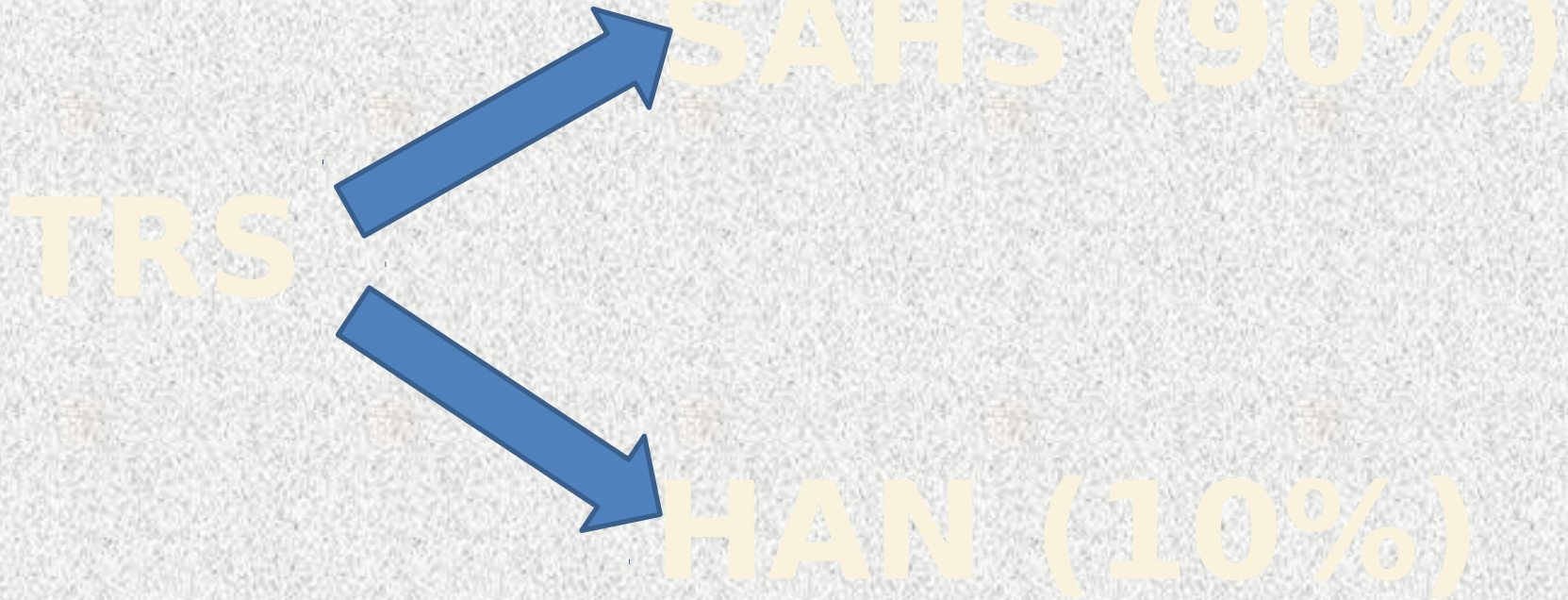
¿QUÉ ES EL SOH?

1

2

3

¿QUÉ ES EL SOH?



POR LA NOCHE…

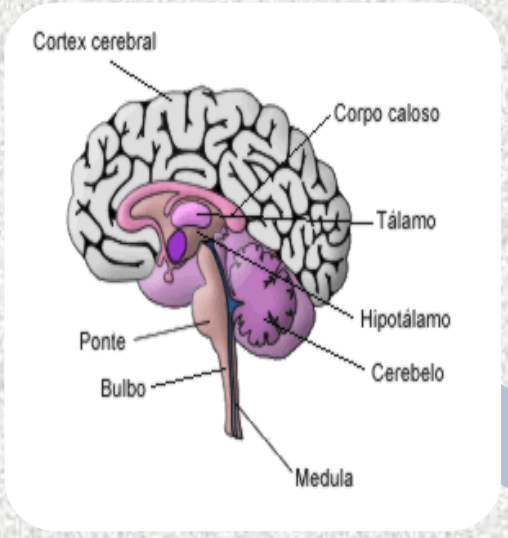
Roncopatía

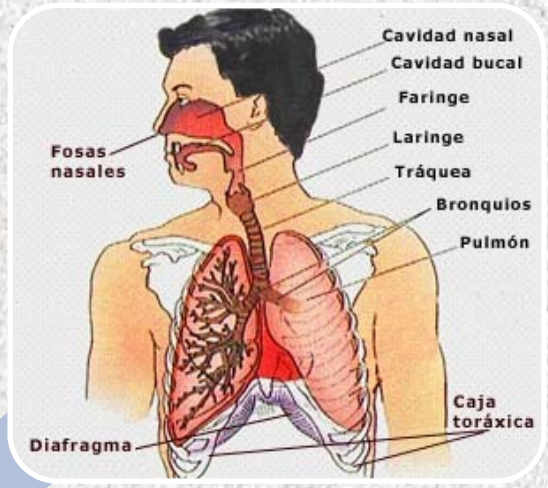
Pausas de apnea

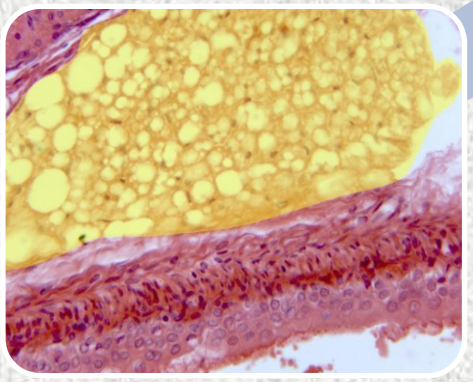
POR EL DÍA...

Somnolencia

Disnea


Cortex cerebral
Corpo caloso
Tálamo
Hipotálamo
Ponte
Cerebelo
Bulbo
Medula


Cavidad nasal
Cavidad bucal
Faringe
Laringe
Fosas nasales
Tráquea
Bronquios
Pulmón
Caja toráxica
Diafragma



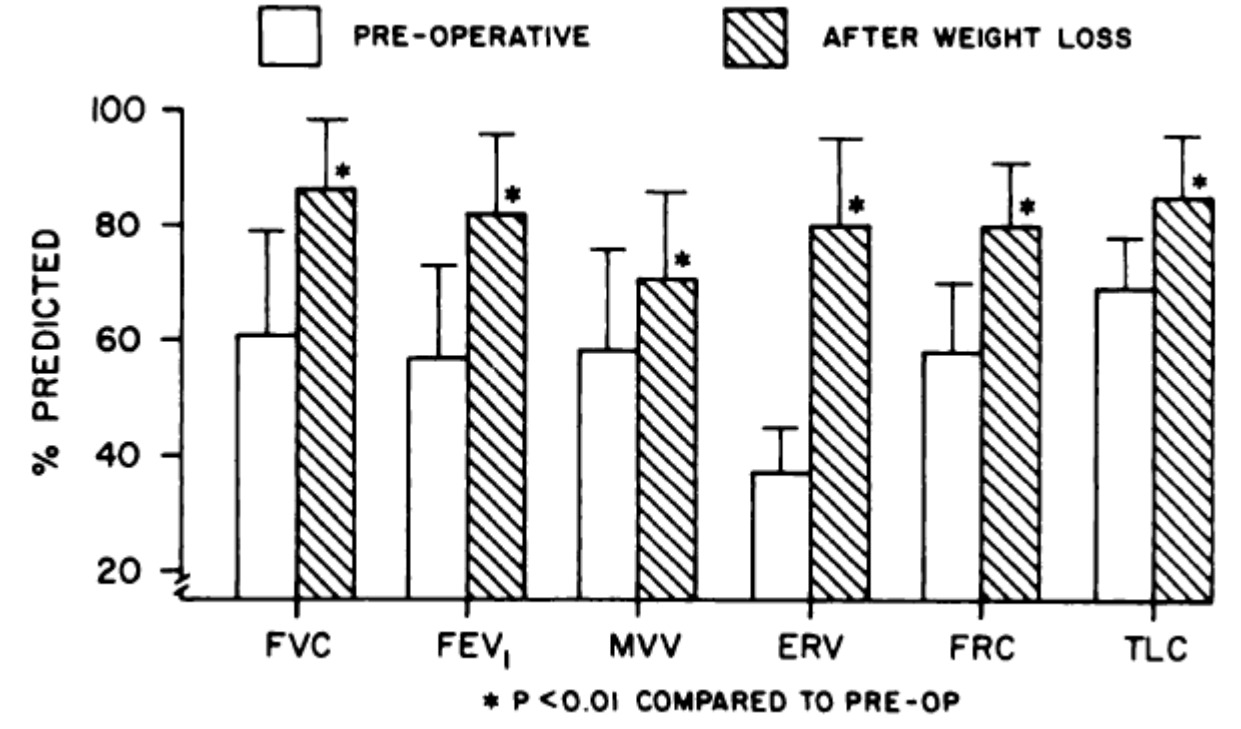
¿Y si perdemos peso?

Effect of weight loss on obesity hypoventilation syndrome*

	Preoperative (n = 61)	1 year (n = 31)	Last visit† (n = 38)
PaO_2 (mm Hg)‡	53 ± 10	73 ± 15§	68 ± 20§
$PaCO_2$ (mm Hg)‡	53 ± 9	44 ± 8§	47 ± 12‖
Asymptomatic (%)	0	66§	76§
Body mass index (kg/m^2)	56 ± 13	38 ± 9§	40 ± 10§
Weight (kg)	163 ± 39	113 ± 30§	115 ± 30§
Ideal body weight (%)	242 ± 55	163 ± 40§	172 ± 43§
Weight loss (%)		33 ± 14§	26 ± 18§
Excess weight loss (%)		58 ± 25§	45 ± 34§

Am J C/in Nuir 1992;55:597S-6OlS
Long-term effects of gastric surgery for treating respiratory insufficiency of obesity.
Harvey J Sugerman, R Paul Fairman, Rakesh K Sood, Kathryn Engle, Luke Wolfe, and John M Kellum

¿Y la función pulmonar?



Am J C/in Nuir 1992;55:597S-6OlS
Long-term effects of gastric surgery for treating respiratory insufficiency of obesity.
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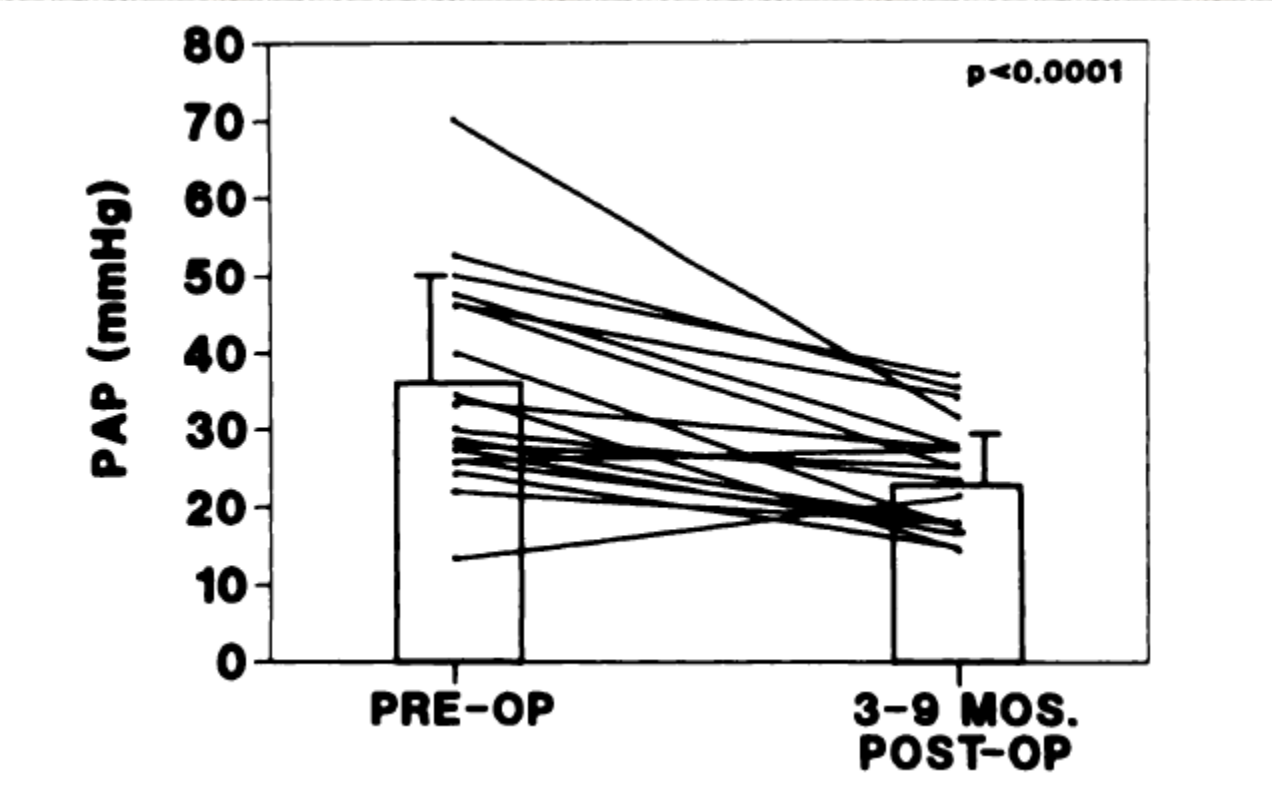
¿Y la hipertensión pulmonar?



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¿Y el trastorno del sueño?

Effect of weight loss on severity of sleep apnea syndrome*

	Preoperative (n = 110)	1 year (n = 63)	Last visit† (n = 57)
Apnea index	64 ± 39‡	33 ± 27§	32 ± 32§
Asymptomatic (%)	0	60§	66§
BMI (kg/m^2)	56 ± 12	37 ± 8§	38 ± 9§
Weight (kg)	166 ± 35	110 ± 23§	114 ± 28§
IBW (%)	244 ± 53	162 ± 33§	165 ± 39§
Weight loss (%)		33 ± 11§	31 ± 16§
Excess weight loss (%)		58 ± 18§	53 ± 29§

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Long-term effects of gastric surgery for treating respiratory insufficiency of obesity.
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1) La obesidad tiene un papel protagonista en el SOH.

2) La pérdida de peso mejora los trastornos de sueño asociados al SOH.

3) La pérdida de peso mejora otros aspectos del SOH, como la mecánica respiratoria y la PAP.

4) Faltan estudios para conocer en profundidad la mejoría que se obtiene al perder peso.

Obesidad y ESD

Table 1. Nocturnal Sleep of Obese Patients and Healthy Controls*

	Obese Patients (n = 73)	Healthy Controls (n = 45)
Sleep efficiency		
SL, min	34.9 ± 3.8	26.2 ± 3.4
WTASO, min	82.4 ± 6.9‡	46.1 ± 6.1
TWT, min	117.3 ± 8.8†	72.3 ± 7.2
ST, %	75.5 ± 1.8†	84.9 ± 1.5
Wake time, min, Third of night		
First	24.5 ± 2.7	16.6 ± 3.4
Second	27.0 ± 3.1†	9.9 ± 2.3
Third	30.3 ± 3.6†	18.2 ± 3.1
Sleep stages, %		
1	10.3 ± .8†	7.3 ± 0.7
2	69.1 ± 0.9	69.4 ± 1.1
SWS	3.9 ± 0.6	3.6 ± 0.8
REM	16.7 ± 0.9‡	19.7 ± 0.9
REM, min	63.9 ± 4.0†	82.2 ± 4.4

Table 2. Daytime Sleep of Obese Patients and Healthy Controls*

	Nap 1	
	Obese Patients (n = 72)	Healthy Controls (n = 45)
Sleep efficiency		
SL, min	13.7 ± 1.9†	22.7 ± 2.8
WTASO, min	4.7 ± 0.6†	8.7 ± 1.4
TWT, min	18.5 ± 1.4†	30.4 ± 2.6
ST, %	69.3 ± 2.8†	49.4 ± 4.4
Sleep stages, %		
1	15.8 ± 1.0	18.1 ± 2.0
2	71.7 ± 2.3	76.0 ± 2.8
SWS	0.7 ± 0.3	0.9 ± 0.7
REM	11.7 ± 2.1‡	5.2 ± 2.5
REM, min	5.1 ± 0.9	2.5 ± 1.2
REM latency	23.5 ± 2.9	29.2 ± 6.9

**All values are mean ± SE. SL indicates sleep latency; WTASO, wake time after onset of sleep; TWT, total wake time; ST, sleep time; SWS, slow-wave sleep; and REM, rapid eye movement.*

Arch Intern Med. 1998;158:1333-1337

Obesity Without Sleep Apnea Is Associated With Daytime Sleepiness

Alexandros N. Vgontzas; Edward O. Bixler; Tjiauw-Ling Tan; Deborah Kantner,; Louis F. Martin; Anthony Kales

De los trastornos del sueño...

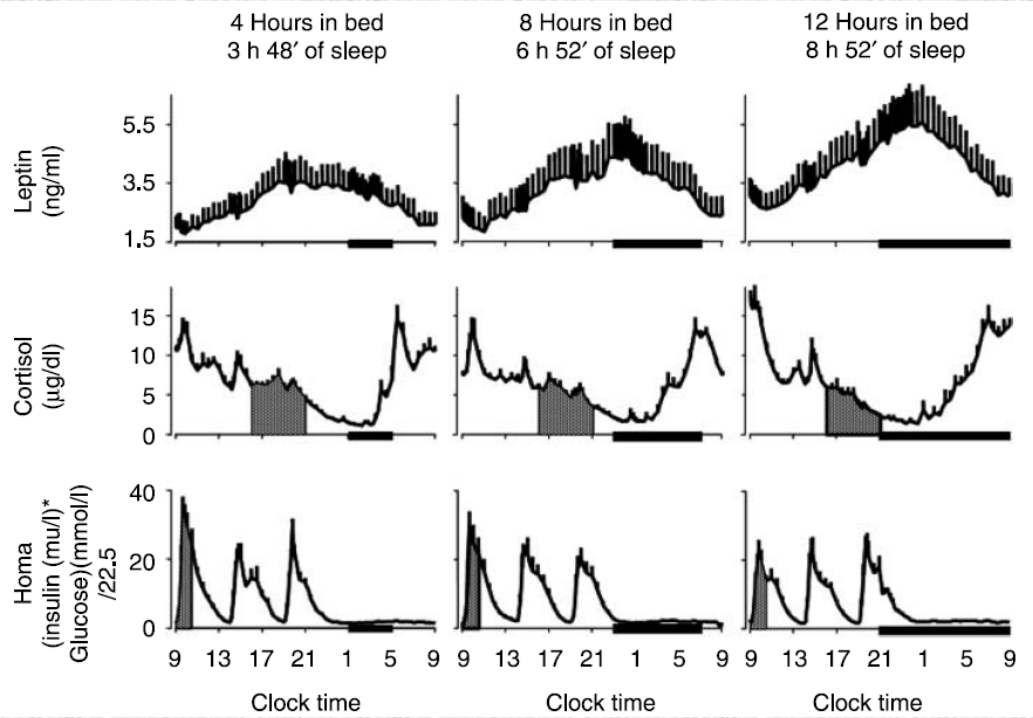
...a la obesidad

Glucosa e insulina

Cortisol

H. del crecimiento

Prolactina



European Journal of Endocrinology (2008) 159 S59–S66
Eve Van Cauter and Kristen L Knutson
Sleep and the epidemic of obesity in children and adults

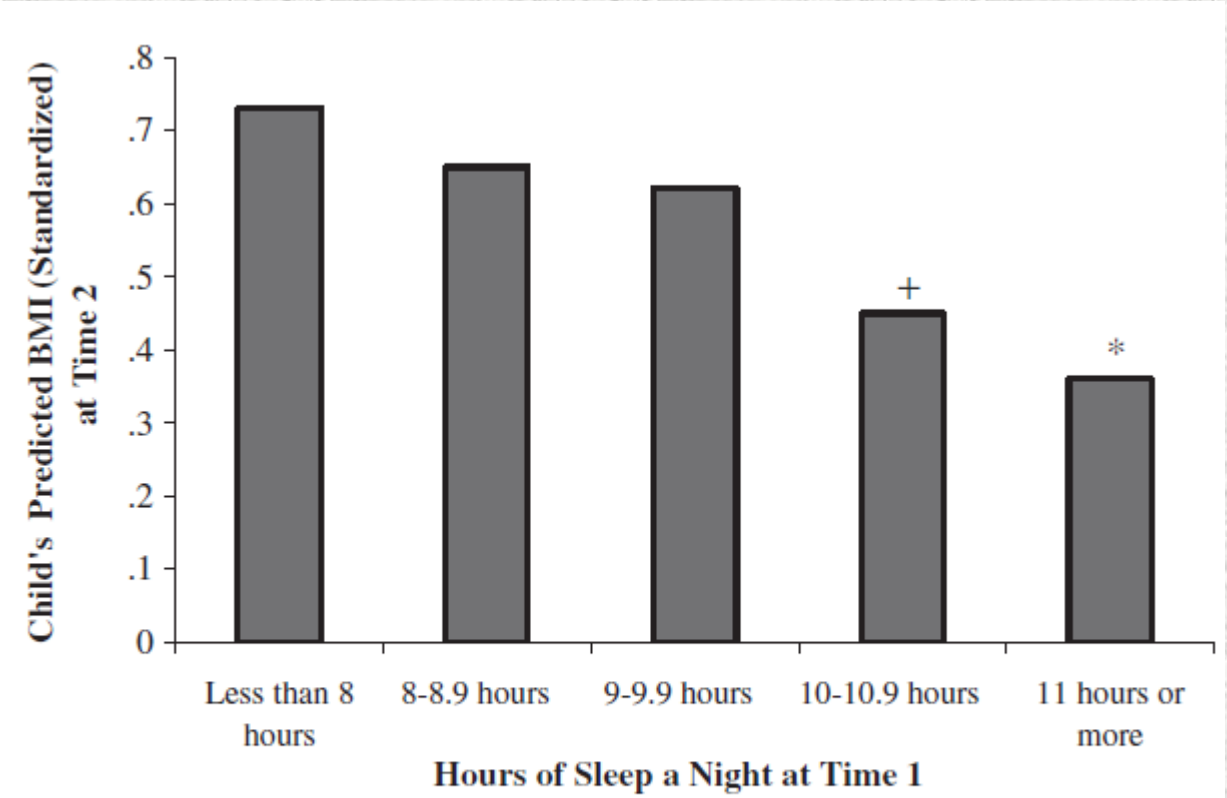


Figure 3. Hours of sleep a night at Time 1 and children's predicted standardized body mass index (BMI) at Time 2.

Child Development, January/February 2007, Volume 78, Number 1, Pages 309 – 323

Emily K. Snell, Emma K. Adam, and Greg J. Duncan

Sleep and the Body Mass Index and Overweight Status of Children and Adolescents

TABLE 2. Cross-sectional relations* of duration of sleep (hours) with body mass index and waist circumference at phase 5 (1997–1999), the Whitehall II Study, London, England (n = 5,021)

	Sleep duration (hours)									
	≤5 (n = 380)		6 (n = 1,650)		7 (n = 2,153)	8 (n = 774)		≥9 (n = 64)		p value†	
	β coefficient	95% confidence interval	β coefficient	95% confidence interval	(reference category)	β coefficient	95% confidence interval	β coefficient	95% confidence interval	Linear	Nonlinear
Body mass index (kg/m^2)											
Model 1‡	1.09§	0.66, 1.52	0.41§	0.16, 0.66	0	−0.28	−0.6, 0.04	−0.22	−1.19, 0.75	<0.001	0.20
Model 2¶	0.94§	0.51, 1.36	0.44§	0.19, 0.68	0	−0.27	−0.59, 0.04	−0.45	−1.41, 0.52	<0.001	0.55
Model 3#	0.82§	0.38, 1.26	0.43§	0.18, 0.68	0	−0.25	−0.57, 0.07	−0.62	−1.59, 0.35	<0.001	0.84
Waist (cm)											
Model 1	2.90§	1.69, 4.11	0.97§	0.26, 1.68	0	−1.17§	−2.1, −0.24	0.25	−2.48, 2.98	<0.001	0.23
Model 2	2.43§	1.23, 3.62	1.04§	0.35, 1.74	0	−1.18§	−2.09, −0.27	−0.73	−3.43, 1.97	<0.001	0.68
Model 3	1.88§	0.64, 3.12	0.93§	0.23, 1.64	0	−1.09§	−2.01, −0.18	−1.38	−4.06, 1.30	<0.001	0.95

Am J Epidemiol 2008;167:321–329
Saverio Stranges, Francesco P. Cappuccio, Ngianga-Bakwin Kandala, Michelle A. Miller, Frances M. Taggart, Meena Kumari, Jane E. Ferrie, Martin J. Shipley, Eric J. Brunner, and Michael G. Marmot
Cross-sectional versus Prospective Associations of Sleep Duration with Changes in Relative Weight and Body Fat Distribution

TABLE 3. Prospective relations* of duration of sleep (hours) with changes in body mass index and waist circumference between phase 5 (1997–1999) and phase 7 (2003–2004), the Whitehall II Study, London, England (n = 4,378)

	Sleep duration (hours)									
	≤5 (n = 307)		6 (n = 1,429)		7 (n = 1,903)	8 (n = 678)		≥9 (n = 61)		p value†
	β coefficient	95% confidence interval	β coefficient	95% confidence interval	(reference category)	β coefficient	95% confidence interval	β coefficient	95% confidence interval	Linear	Nonlinear
Body mass index (kg/m^2)											
Model 1‡	0.02	−0.17, 0.21	0.02	−0.09, 0.13	0	0.08	−0.06, 0.22	−0.20	−0.59, 0.20	0.89	0.72
Model 2§	0.01	−0.18, 0.20	0.03	−0.08, 0.13	0	0.08	−0.06, 0.21	−0.20	−0.60, 0.20	0.95	0.81
Model 3¶	−0.06	−0.26, 0.14	0.00	−0.11, 0.11	0	0.09	−0.05, 0.23	−0.17	−0.58, 0.24	0.36	0.82
Waist (cm)											
Model 1	0.56	−0.08, 1.21	0.14	−0.22, 0.51	0	0.14	−0.33, 0.61	−0.39	−1.73, 0.96	0.22	0.44
Model 2	0.58	−0.07, 1.23	0.16	−0.20, 0.53	0	0.11	−0.37, 0.58	−0.30	−1.67, 1.07	0.17	0.50
Model 3	0.44	−0.23, 1.12	0.12	−0.26, 0.49	0	0.15	−0.33, 0.63	−0.34	−1.71, 1.03	0.39	0.58

Am J Epidemiol 2008;167:321–329

Saverio Stranges, Francesco P. Cappuccio, Ngianga-Bakwin Kandala, Michelle A. Miller, Frances M. Taggart, Meena Kumari, Jane E. Ferrie, Martin J. Shipley, Eric J. Brunner, and Michael G. Marmot

Cross-sectional versus Prospective Associations of Sleep Duration with Changes in Relative Weight and Body Fat Distribution

Abdominal Fat and Sleep Apnea

The chicken or the egg?

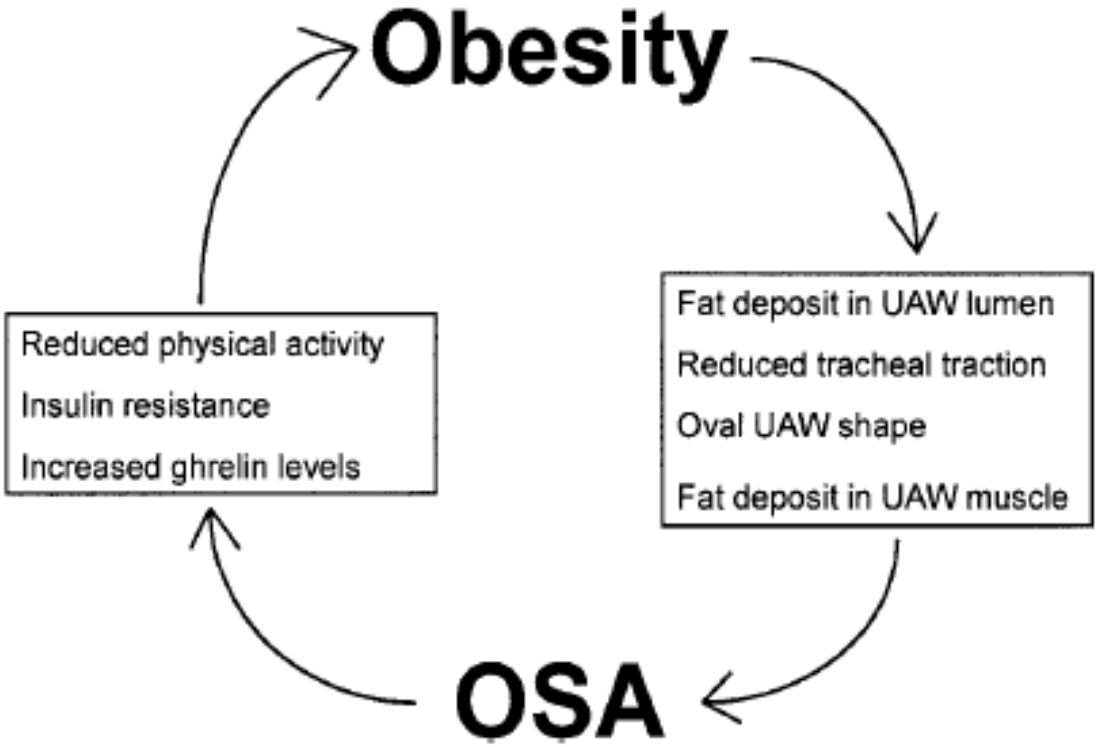


Figure 1—*Potential mechanisms formatting a vicious cycle where obesity may result in OSA and OSA may lead to weight gain (see text for details). UAW, upper airway.*

¿Y si tratamos el SAHS?

	Sleep apnoeics		Obese controls
	Pre CPAP (*n* = 16)	**Post CPAP (*n* = 16)**	**(*n* = 13)**
BMI (kg m^{-2})	37·5 ± 4·7	37·5 ± 4·9	35·4 ± 3·2
Total body fat area (cm^3)	641·8 ± 44·8	642·2 ± 42·9	565·1 ± 35·4
Subcutaneous fat area (cm^3)	305·1 ± 32·3	310·5 ± 26·1	315·5 ± 30·6
Visceral fat area (cm^3)	336·7 ± 28·3	331·7 ± 27·6	249·6 ± 24·1*

European Journal of Clinical Investigation Vol 38
A. N. Vgontzas, E. Zoumakis, E. O. Bixler, H-M. Lin, B. Collins, M. Basta, S. Pejovic and G. P. Chrousos
Selective effects of CPAP on sleep apnoea associated manifestations

1) Existe una clara asociación entre la obesidad y los trastornos del sueño.

2) La obesidad está claramente implicada en el desarrollo del SAHS y del SOH.

3) La pérdida de peso mejora claramente ambos problemas.

4) Faltan estudios para poder conocer con exactitud el papel de los trastornos del sueño en el desarrollo de obesidad.

Muchas gracias

Thank you very much